Table 1

Size of case series for case-control studies using an equal number of controls and for studies to test for transmission disequilibrium (TDT), by genotypic risk ratio, and allele frequency (power of 80% and alpha = 0.001, 2-sided)

Genotypic Risk Ratio	Frequency of disease allele (A)	Expected Odds Ratio (A vs no A)	Case-Control Study Population frequency of A (p2+2pq)	# cases needed Case-Control	TDT
4	0.01	4.06	0.02	489	917
4	0.10	4.63	0.19	70	127
4	0.50	8.00	0.75	94	88
4	0.80	12.0	0.96	542	187
2	0.01	2.01	0.02	2612	5207
2	0.10	2.11	0.19	329	616
2	0.50	2.67	0.75	260	302
2	0.80	3.33	0.96	1138	566
1.5	0.01	1.50	0.02	8789	16960
1.5	0.10	1.54	0.19	1055	2152
1.5	0.50	1.75	0.75	685	848
1.5	0.80	2.00	0.96	2604	1483

In this case-control study, the frequency of the A allele is compared between the two groups. The expected proportion of A is the frequency of homozygotes and heterozygotes for A according to the Hardy-Weinberg equilibrium. The odds ratio for any A is a weighted average for the odds ratio associated with one A and that associated with two A alleles. The multiplicative effects of alleles may not be biologically the most correct model but the comparative analysis of TDT and case-control study design should not be affected.

Table 2

Advantages of Population-based Case-Control Studies For Assessing the Role of Genes in Complex Human Diseases

---

1. They are easier to conduct than family studies (for adult-onset diseases but not for diseases of infancy and childhood)

2. They have similar if not better statistical power in finding genes than TDT and linkage analysis

3. They can assess the magnitude of disease risks associated with specific alleles in the population while TDT does not provide direct estimates of risk

4. They can measure directly gene-gene and gene-environment interaction in quantifying disease risks

5. They can measure the fraction of disease attributable to specific genes in various populations